CLAIMS

What is claimed is:

1.   A method of calculating the radiated sensitivity of a mobile terminal

comprising:

5   determining a reference sensitivity of the mobile terminal positioned in a

reference orientation;

estimating an antenna gain of a mobile terminal antenna when the mobile

terminal is positioned in a test orientation; and

adjusting the reference sensitivity based on the estimated antenna gain to

10   calculate the sensitivity of the mobile terminal positioned in the test

orientation.

2.   The method of claim 1 wherein estimating the antenna gain of the mobile

terminal antenna when the mobile terminal is positioned in the test orientation

15 comprises:

applying a known power level to the mobile terminal antenna when the mobile

terminal is positioned in the test orientation; and

comparing the known antenna power level to a measured power level

reported by the mobile terminal to estimate the antenna gain.

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3.   The method of claim 2 wherein adjusting the reference sensitivity based on

the estimated antenna gain to calculate the sensitivity of the mobile terminal

positioned in the test orientation comprises calculating the sensitivity, S, of the mobile

terminal according to:

25                              $S = P_A - P_{meas} + S_r$,

where P_A represents the known antenna power level, P_{meas} represents the measured

power level, $P_A - P_{meas}$ represents the estimated antenna gain, and S_r represents

the reference sensitivity.

5   4.   The method of claim 1 further comprising determining a correction factor for

each of a plurality of measured power levels reported by the mobile terminal.

5.   The method of claim 4 wherein determining the correction factor for each of

the plurality of measured power levels comprises:

10   applying a plurality of known power levels to an input of a receiver of the

                  mobile terminal; and

          comparing each of the known power levels to a corresponding measured

                  power level reported by the mobile terminal to determine the

                  correction factor for each measured power level.

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6.   The method of claim 4 wherein determining the reference sensitivity of the

mobile terminal positioned in the reference orientation further comprises applying the

corresponding correction factor to the reference sensitivity to determine a corrected

reference sensitivity.

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7.   The method of claim 4 wherein estimating the antenna gain of the mobile

terminal antenna comprises:

          applying a known power level to the mobile terminal antenna when the mobile

                  terminal is positioned in the test orientation;

25   applying the corresponding correction factor to a measured power level

                  reported by the mobile terminal to determine a corrected power level;

                  and

comparing the known antenna power level to the corrected power level to

determine a corrected estimate of the antenna gain.

8.   The method of claim 4 wherein adjusting the reference sensitivity based on

5   the estimated antenna gain to calculate the sensitivity of the mobile terminal

positioned in the test orientation comprises calculating the sensitivity, S, of the mobile

terminal receiver according to:

$$S = P_A - P_{corr} + S_{corr},$$

where P_A represents the known antenna power level, P_{corr} represents the measured

10   power level as corrected by the correction factor, $P_A - P_{corr}$ represent the estimated

antenna gain as corrected by the correction factor, and S_{corr} represents the

reference sensitivity as corrected by the correction factor.

9.   The method of claim 4 further comprising determining the correction factors

15   for one or more frequency channels.

10.   The method of claim 1 wherein determining the reference sensitivity of the

mobile terminal positioned in the reference orientation comprises:

applying a known communication signal at one or more known antenna power

20   levels to the mobile terminal antenna when the mobile terminal is

positioned in the reference orientation;

receiving a looped-back version of each communication signal and

corresponding measured power level;

calculating a signal quality of each looped-back version of the communication

25   signal;

comparing each of the calculated signal qualities to a predefined signal

quality; and

identifying the reference sensitivity as the measured power level that

generally corresponds to the predefined signal quality.

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11.   The method of claim 10 wherein the signal quality is a bit error rate.

12.   The method of claim 10 wherein the signal quality is a frame error rate.

10   13.   The method of claim 1 further comprising adjusting the reference sensitivity

based on the estimated antenna gain to calculate the sensitivity of the mobile

terminal positioned in the test orientation for each combination of one or more

frequency channels with one or more mobile terminal configurations.

15   14.   The method of claim 13 wherein the one or more frequency channels

comprise a high, a medium, and a low frequency in a frequency operating band of

the mobile terminal.

15.   The method of claim 13 wherein the one or more mobile terminal

20   configurations comprise a free-space configuration, a left-ear configuration, and a

right-ear configuration.

16.   The method of claim 1 further comprising:

estimating a second antenna gain when the mobile terminal is positioned in

25   the second test orientation; and

adjusting the reference sensitivity based on the second estimated antenna

gain to calculate a second sensitivity of the mobile terminal positioned

in a second test orientation.

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17.   A computer readable medium to store a computer program for calculating a

radiated sensitivity of a mobile terminal, the computer program comprising:

program instructions to determine a reference sensitivity of the mobile

terminal positioned in a reference orientation;

5   program instructions to estimate an antenna gain of a mobile terminal

antenna when the mobile terminal is positioned in a test orientation;

and

program instructions to adjust the reference sensitivity based on the

estimated antenna gain to calculate the sensitivity of the mobile

10   terminal positioned in the test orientation.

18.   The computer readable medium of claim 17 wherein the program instructions

to estimate the antenna gain of the mobile terminal antenna when the mobile terminal

is positioned in the test orientation comprises:

15   program instructions to apply a known power level to the mobile terminal

antenna when the mobile terminal is positioned in the test orientation;

and

program instructions to compare the known antenna power level to a

measured power level reported by the mobile terminal to estimate the

20   antenna gain.

19.   The computer readable medium of claim 18 wherein the program instructions

to adjust the reference sensitivity based on the estimated antenna gain to calculate

the sensitivity of the mobile terminal positioned in the test orientation comprises

25   program instructions to calculate the sensitivity, S, of the mobile terminal according

to:

$$S = P_A - P_{meas} + S_r,$$

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where P_A represents the known antenna power level, P_{meas} represents the measured power level, $P_A - P_{meas}$ represents the estimated antenna gain, and S_r represents the reference sensitivity.

5   20.   The computer readable medium of claim 17 further comprising program instructions to determine a correction factor for each of a plurality of measured power levels reported by the mobile terminal.

21.   The computer readable medium of claim 20 wherein the program instructions

10   to determine the correction factor for each of the plurality of measured power levels comprises:

     program instructions to apply a plurality of known power levels to an input of a

        receiver of the mobile terminal; and

     program instructions to compare each of the known power levels to a

15   corresponding measured power level reported by the mobile terminal

        to determine the correction factor for each measured power level.

22.   The computer readable medium of claim 20 wherein the program instructions to determine the reference sensitivity of the mobile terminal positioned in the

20   reference orientation further comprises program instructions to apply the corresponding correction factor to the reference sensitivity to determine a corrected reference sensitivity.

23.   The computer readable medium of claim 20 wherein the program instructions

25   to estimate the antenna gain of the mobile terminal antenna when the mobile terminal is positioned in the test orientation comprises:

program instructions to apply a known power level to the mobile terminal

antenna when the mobile terminal is positioned in the test orientation;

program instructions to apply the corresponding correction factor to a

measured power level reported by the mobile terminal to determine a

5   corrected power level; and

program instructions to compare the known antenna power level to the

corrected power level to determine a corrected estimate of the

antenna gain.

10   24.   The computer readable medium of claim 20 wherein the program instructions

to adjust the reference sensitivity based on the estimated antenna gain to calculate

the sensitivity of the mobile terminal positioned in the test orientation comprises

program instructions to calculate the sensitivity, S, of the mobile terminal receiver

according to:

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$$S = P_A - P_{corr} + S_{corr},$$

where P_A represents the known antenna power level, P_{corr} represents the measured

power level as corrected by the correction factor, $P_A - P_{corr}$ represent the estimated

antenna gain as corrected by the correction factor, and S_{corr} represents the

reference sensitivity as corrected by the correction factor.

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25.   The computer readable medium of claim 20 further comprising program

instructions to determine the correction factors for one or more frequency channels.

26.   The computer readable medium of claim 17 wherein the program instructions

25   to determine the reference sensitivity of the mobile terminal positioned in the

reference orientation comprises:

program instructions to apply a known communication signal at one or more

known antenna power levels to the mobile terminal antenna when the

mobile terminal is positioned in the reference orientation;

program instructions to receive a looped-back version of each communication

5   signal and corresponding measured power level;

program instructions to calculate a signal quality of each looped-back version

of the communication signal;

program instructions to compare each of the calculated signal qualities to a

predefined signal quality; and

10   program instructions to identify the reference sensitivity as the measured

power level that generally corresponds to the predefined signal

quality.

27.   The computer readable medium of claim 17 further comprising program

15   instructions to adjust the reference sensitivity based on the estimated antenna gain to

calculate the sensitivity of the mobile terminal positioned in the test orientation for

each combination of one or more frequency channels with one or more mobile

terminal configurations.

20   28.   The computer readable medium of claim 17 further comprising:

program instructions to estimate a second antenna gain when the mobile

terminal is positioned in a second test orientation; and

program instructions to adjust the reference sensitivity based on the second

estimated antenna gain to calculate a second sensitivity of the mobile

25   terminal positioned in the second test orientation.

29.   A test system for calculating a radiated sensitivity of a mobile terminal

comprising:

a first interface;

a sensitivity test processor for configuring the test system in one of a plurality

5   of test modes;

wherein in a first test mode, the test system determines a reference sensitivity

of the mobile terminal positioned in a reference orientation via the first

interface;

wherein in a second test mode, the test system estimates an antenna gain of

10   a mobile terminal antenna via the first interface when the mobile

terminal is positioned in a test orientation; and

a sensitivity calculator for calculating the sensitivity of the mobile terminal

positioned in the test orientation by adjusting the reference sensitivity

based on the estimated antenna gain.

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30.   The test system of claim 29 wherein in the second test mode, the sensitivity

test processor configures the test system to:

apply a known power level to the mobile terminal antenna via the first

interface when the mobile terminal is positioned in the test orientation;

20   and

compare the known antenna power level to a measured power level reported

by the mobile terminal to estimate the antenna gain of the mobile

terminal antenna when the mobile terminal is positioned in the test

orientation.

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31.   The test system of claim 29 further comprising a second interface, wherein in

a third test mode, the test system determines a correction factor for each of a

plurality of measured power levels reported by the mobile terminal via the second interface.

32.   The test system of claim 31 wherein in the third test mode, the sensitivity test processor configures the test system to:

apply a plurality of known power levels to an input of a receiver of the mobile terminal via the second interface; and

compare each of the known power levels to a corresponding measured power level reported by the mobile terminal to determine the correction factor for each measured power level.

33.   The test system of claim 31 further comprising a memory for storing each correction factor.

34.   The test system of claim 31 wherein in the second test mode, the sensitivity test processor configures the test system to:

apply a known power level to the mobile terminal antenna via the first interface when the mobile terminal is positioned in the test orientation;

apply the corresponding correction factor to a measured power level reported by the mobile terminal to determine a corrected power level; and

compare the known antenna power level to the corrected power level to estimate the antenna gain of the mobile terminal antenna when the mobile terminal is positioned in the test orientation.

35.   The test system of claim 31 wherein at least one of the first and third test modes comprise a characterization mode.

36.   The test system of claim 31 wherein the second interface comprises a coaxial
cable.

37.   The test system of claim 29 wherein in the first test mode, the sensitivity test
5   processor configures the system to:

apply a known communication signal at one or more known antenna power

levels to the mobile terminal antenna when the mobile terminal is

positioned in the reference orientation;

receive a looped-back version of each communication signal and

10   corresponding measured power level;

calculate a signal quality of each looped-back version of the communication

signal;

compare each of the calculated signal qualities to a predefined signal quality;

and

15   identify the reference sensitivity as the measured power level that generally

corresponds to the predefined signal quality.

38.   The test system of claim 37 wherein the signal quality is a bit error rate.

20   39.   The test system of claim 37 wherein the signal quality is a frame error rate.

40.   The test system of claim 29 wherein the second test mode comprises a data
collection mode.

25   41.   The test system of claim 29 wherein the first interface comprises a test
antenna.